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Materiel Test Procedure 3-2-056\*  
Aberdeen Proving Ground

U. S. ARMY TEST AND EVALUATION COMMAND  
COMMODITY ENGINEERING TEST PROCEDURE

ROCKET LAUNCHERS (GROUND-TO-GROUND)

AD876256

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1. OBJECTIVE

The purpose of this test procedure is to provide methods for testing ground-to-ground (artillery and infantry type) rocket launchers with regard to safety features, performance, and durability. Primary areas of investigation are functioning characteristics and weakness in material and design.

2. BACKGROUND

Rocket launchers are used to hold the rockets in the proper firing attitude and to guide them during the initial part of their flight. The launcher usually incorporates an integral electrical firing system for igniting the rocket motor propellant. Mechanical primer ignition may also be used. Fundamental differences in design and construction exist between rocket launchers and tube artillery weapons. An artillery weapon has a closed breech and must be designed to withstand the high internal gas pressures required to force the projectile out of the gun barrel and to withstand and absorb the reactive force (recoil) that follows projectile exit. Conversely, the typical rocket launcher is an open-breech mechanism that acts primarily as a directional guide for the rocket. The burning gases providing the reactive forces for the rocket are expelled from the rocket motor to the rear of the launcher, eliminating the requirement for a recoil mechanism. For this reason, the rocket launcher can be made lightweight, simple in operation, and be fabricated of inexpensive materials, providing an advantage over closed-breech weapons from the standpoints of cost and maneuverability.

REQUIRED EQUIPMENT

- a. A test stand, suitable for mounting infantry type rocket launchers rigidly during unmanned firing tests, adjustable in azimuth and elevation, and containing the necessary equipment to fire the rocket launcher remotely.
- b. Other facilities and instrumentation as noted in paragraph 6.

4. REFERENCES

- A. AR 70-38, Research, Development, Test and Evaluation of Materiel for Extreme Climatic Conditions.
- B. MIL-STD-810B, Environmental Test Methods.
- C. Cheater, H. W. and Feroli, J. A., Study to Determine High Temperature Test Procedures for Selected Infantry Weapons to Satisfy AR 705-15, Cl, Aberdeen Proving Ground, Md., Report DPS-1692, October 1965.
- D. USATECOM Regulation 385-6, Verification of Safety of Materiel During Testing.

\* Supersedes OPM 40-20.

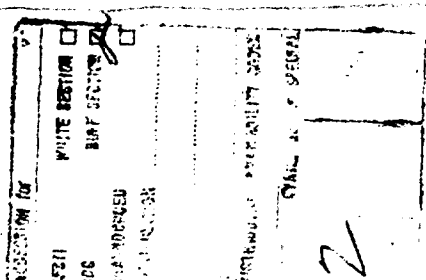
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- E. MTP 2-2-511, Road Tests of Mobile Weapons.
- F. MTP 2-2-610, Gradeability and Side Slope Performance Mobility.
- G. MTP 2-2-815, Rain and Freezing Rain.
- H. MTP 3-2-045, Machine Guns.
- I. MTP 3-2-500, Weapon Characteristics.
- J. MTP 3-2-805, Service Life and Safety Test for Gun Tubes.
- K. MTP 3-2-811, Noise and Blast Measurements.
- L. MTP 3-2-816, Non Firing.
- M. MTP 4-2-503, Safety Evaluation - Close Support Rockets and Missiles.
- N. MTP 4-2-602, Rough Handling Tests.
- O. MTP 4-2-804, Laboratory Vibration Tests.
- P. MTP 4-2-819, Sand and Dust Testing of Ammunition.
- Q. MTP 4-2-820, Humidity Tests.
- R. MTP 4-2-824, Penetration Tests of HEAT Warheads for Close Support Rockets and Missiles.
- S. MTP 4-2-826, Solar Radiation Tests.
- T. MTP 4-2-829, Vertical Target Accuracy and Dispersion.
- U. MTP 5-1-031, Cinetheodolites.
- V. MTP 7-2-009, Aircraft Rocket Subsystems.

## 5. SCOPE

### 5.1 SUMMARY

This MTP covers the following phases of testing for ground-to-ground rocket launchers:

- a. Physical and operating characteristics examination (par. 6.2.1)
- b. Safety evaluation (par. 6.2.2)
- c. Other environmental and shock tests (par. 6.2.3)
- d. Firing tests of artillery rocket launchers (par. 6.2.4)
- e. Firing tests of infantry rocket launchers (par. 6.2.5)

### 5.2 LIMITATIONS

This MTP does not include methods for testing aircraft-mounted rocket launchers which are covered in MTP 7-2-009.

Additional information on the testing of infantry rocket weapons (antitank) is in MTP's 4-2-824 and 4-2-829. Safety testing of rocket ammunition is discussed in MTP 4-2-503.

## 6. PROCEDURES

### 6.1 PREPARATION FOR TEST

The rocket launcher to be tested is studied and photographed, and the construction and principles of operation are determined. Technical literature

available for the weapon is studied, to assist in familiarization. Accessories provided are examined and photographed and are evaluated concurrently with the testing of the weapon. Preparations for individual subtests are described below.

## 6.2 TEST CONDUCT

The subtests described below are conducted as applicable to evaluate the test materiel. Each launcher sample may be subjected to a number of tests, not only to evaluate the cumulative effects of environmental treatment and rocket firing but also to reduce the total test sample requirements.

Throughout these tests notes are made on the adequacy of the operating and maintenance manuals.

### 6.2.1 Physical and Operating Characteristics Examination

#### 6.2.1.1 Inspections and Measurements

The following nondestructive inspections and measurements are made upon receipt of the test item:

- a. The total weight and center of gravity are determined in the firing position (loaded and unloaded) and the traveling or carrying position.
- b. Stargage (internal diameter) and overall length measurements are made of the launcher tubes.
- c. Trammel points are scribed upon the launcher for later use in determining whether deformation has occurred during environmental or firing tests. For multiple-tube launchers, the accuracy of tube alignment is also determined.
- d. The overall height, width, and length of the launcher or launcher-carriage assembly are determined.
- e. The launcher loading and unloading characteristics (muzzle or breech) and type of rocket motor ignition and rocket detent are noted and recorded.
- f. The electrical operating characteristics of the test item are studied and measured, as applicable:
  - 1) Inspection is made for proper shielding and ground of firing circuits, and for protection of electrical wiring and circuitry from damage during transporting, handling, and firing. Continuity, resistance, and insulation resistance checks are performed in accordance with applicable drawings and specifications.
  - 2) The electrical output of the firing mechanism is measured at the launcher electrical contact terminal or finger, under full-load and no-load conditions. A record of the electrical output wave shape is made for both loading conditions and is compared with design specifications. The above procedures should be repeated following each environmental test or series of rocket firing tests. If a circuit tester is provided as part of the operational equipment of the launcher, it should also be utilized.

- 3) Total steady-state and intermittent (peak) electrical power requirements of the launcher are measured and the adequacy of the power source (battery, magneto-type impulse generator, etc.) to provide these requirements during the life cycle of the launcher is determined. At least 1000 simulated firings, with dummy electrical load in place, should be conducted to evaluate reliability and durability of the firing mechanism.

g. The launcher is partially or totally disassembled in accordance with procedures provided in applicable technical and maintenance manuals. All parts are examined for proper lubrication, adjustment, damage, conformity with design specifications, and evidence of good manufacturing practice. Irregularities discovered are photographed and evaluated. Following testing, the disassembly procedures are repeated, and any additional damage or wear accrued during testing is noted.

h. Sighting equipment provided is inspected for ease of mounting to the launcher and positive locking in the mount. The field of view and area of view of the sight and limits of elevation (upper and lower) of the sighting mount are determined. If scale divisions in range (elevation) and deflection are provided, their accuracy is checked with quadrant or clinometer and surveying equipment. For direct-fire sighting equipment, the collimation accuracy between the sighting axis and the launcher boresight is checked, and errors are noted. The uniformity of the sight reticle pattern is measured by laying the sight on calibration targets at known ranges. Accuracy of graduations, clarity, and operating convenience of the sighting equipment are also noted.

NOTE: Procedures i through n below are for use with artillery type weapons only.

i. Carriage weight reactions are determined at the locations listed below. These reactions should be determined in both firing and traveling positions, where applicable:

- 1) On the axle(s).
- 2) At the spade (firing position only).
- 3) At the lunette (traveling position only).
- 4) On the right and left wheels, with launcher traversed maximum right, maximum left, and in the center position.

j. The minimum road clearance of the launcher is determined as well as the wheel and tire size of the launcher.

k. The upper and lower limits of launcher elevation are determined with a clinometer and gunner's quadrant. The alignment accuracy of the quadrant pads and/or sighting equipment mounts provided is checked.

l. The maximum deflection limits of the launcher tube at maximum, minimum, and mean elevations are determined by use of the sighting equipment provided with the weapon or with surveying equipment.

m. Handwheels provided for control of launcher azimuth and elevation are operated to determine the number of turns and amount of time required to elevate and traverse the launcher from one extreme position to the other (and

back to the starting position), with launchers loaded and empty.

n. Handwheel reactions (torque required to initiate rotation of the handwheel) are measured on all handwheels. A small, pull-type spring scale and a line attached to the periphery of the handwheel may be used for this measurement. A minimum of five readings is made by each of two operators, and the results are averaged. All backlash in the elevating or traversing mechanism must be taken up before the torque reading is made. Handwheel reactions are measured with launchers empty and loaded, and with the launcher cluster in the mean and near extreme positions of elevation and traverse.

NOTE: Procedures o and p below are intended for use with direct-fire, infantry type rocket launchers but may also be used with artillery type rocket launchers when a requirement for transporting loaded launchers exists.

o. Rocket detent or pullover force (the forward force required to release the rocket from the launcher tube detent) is measured, using an inert rocket and a spring scale. The force is applied several times, and the values are averaged.

p. The launcher detent or latch mechanism is tested for durability by cycling an inert rocket through the launcher (one tube) at least 1000 times.

#### 6.2.1.2 Characteristics Data Sheet

A characteristics data sheet, suitable for the formal report and other uses, is prepared. This consists of a general view photograph of the launcher, together with a listing of all principal physical and performance characteristics, assembled on a glossy 8-by 10-inch print as described in MTP 3-2-500.

#### 6.2.2 Safety Evaluation

##### 6.2.2.1 General

Before the service testing of a rocket launcher is permitted a safety evaluation must be conducted that, if successful, will lead to a safety release by USATECOM in accordance with USATECOM Regulation 385-6. The safety evaluation is conducted early in both the engineering test and in the initial production test. In general, the safety evaluation of launchers follows the same principles as those used in the safety evaluation of mortars and recoilless rifles which are covered by MTP 3-2-805.

The safety evaluation must consider certain test design criteria (6.2.2.2 below) and it must include firing tests that will assure safe performance under extreme conditions. Though the tests conducted under the safety evaluation are basically concerned with safety, performance data are taken as inputs to the overall performance record.

##### 6.2.2.2 Criteria for Planning Test

MTP 3-2-805 should be referred to for the procedures involved in safety

evaluation which include:

- a. Test data and design review ( review of performance of the item or similar designs in previous tests, and a determination of potential design weakness).
- b. Statistical sample planning.
- c. Review of safety statement from the commodity command.
- d. Increased severity testing (possible increases in severity to reduce sample size).
- e. Inspection for incipient failure (to locate areas that have become points of potential failure as a result of firing).

#### 6.2.2.3 Selection of Rockets for Firing

The rockets fired during the safety evaluation of the launcher must have been thoroughly tested (preferably type classified), and they must include those models that are expected to generate the greatest initial thrusts. Inert warheads are used in all safety evaluation firings. Rockets are fired remotely.

#### 6.2.2.4 Ambient Conditions Performance Safety Check

Following inspection and measurements (par. 6.2.1), each single-tube launcher submitted for test will be fired five times using the rockets that will produce the maximum amount of stress. Each multiple-tube launcher will be fired once single shot and once in the ripple-fired mode. Following the firings, each launcher will be examined for damage and potential problems, and testing will not be continued until any problem is fully corrected.

#### 6.2.2.5 Low Temperature Storage and Firing Tests

Low temperature tests are conducted in compliance with AR 70-38. Unless guidance to the contrary is received, the rocket launchers will be tested at -50° F which is the storage and operating temperature for cold climates under AR 70-38. Should the launchers be required to perform only under intermediate conditions, -50° F is still used, but it is then considered an overtest for safety reasons. The test item is held in a chamber at -50° F for 3 days during which nonfiring tests of the electrical firing mechanism are conducted, loading and unloading of inert rockets is performed, simulated firing is conducted, and an inspection is made for malfunctions.

The rockets to be fired are conditioned at the same temperature as the launcher, and, if a suitable facility exists, the rockets are fired (ripple-fired in the case of multiple-tube launchers) from within the conditioning chamber. The launcher is reloaded and fired again immediately. If a suitable facility from which to fire does not exist, the launcher, fitted with thermocouples for temperature recording, is taken outdoors and fired as quickly as possible. Firing should cover the elevations and azimuths of which the system is capable.

If satisfactory performance is not achieved at -50° F, the test is repeated at -35° F and -25° F as necessary to indicate limiting functioning and

safety temperatures.

#### 6.2.2.6 High Temperature Storage and Firing Tests

High temperature tests are conducted in compliance with AR 70-38. Unless otherwise specified, the launcher will be expected to withstand storage at 155° F, be safe to fire under hot-dry conditions, and perform satisfactorily under intermediate conditions.

The launcher will be stored for 7 days at 155° F, the temperature raised to 165° F (Ref. 4C), and the same inspection, exercising, inert loading, etc., will be conducted at high temperature as at low temperature. Firing will consist of at least five rockets from single-tube launchers, or two full-load ripples from multiple-tube launchers fired as quickly as possible. The rockets themselves will be conditioned to 145° F and fired at that temperature.

If satisfactory performance is not achieved at 165° F, the test is repeated at 150° F and 135° F as necessary to indicate limiting functioning and safety temperatures.

If a suitable solar radiation facility exists, a high temperature firing test will be conducted under the solar radiation lamps (in accordance with MTP 4-2-826) rather than at 165° F.

#### 6.2.2.7 Rain and Freezing Rain Tests

A rain test is performed in accordance with MTP 2-2-815. A desirable method of conducting this test is to emplace the launcher in the firing position (or install the infantry-type launcher in a remote firing fixture) and load the launcher with rockets. The launcher is exposed to conditions as close to AR 70-38 or MIL-STD-810B as facilities permit. All parameters of the rainfall are recorded. After the required exposure period, and while the rain is still falling, the launcher is fired (ripple-fired if a multiple-tube launcher), reloaded, and fired again. Any misfires or other malfunctions are noted and the cause determined. Electrical short-circuiting is particularly important.

A freezing rain test is conducted in accordance with MTP 2-2-815.

#### 6.2.2.8 Noise and Blast

See paragraph 6.2.5.3.

#### 6.2.3. Other Environmental and Shock Tests

##### 6.2.3.1 Sand and Dust, Humidity, and Salt Spray

a. Environmental tests such as sand and dust, humidity, and salt spray are conducted (if test chambers large enough to contain the test item are available). Specifications for these and other environmental tests are found in MTP 4-2-819, MTP 4-2-820, and MIL-STD-810B. MTP 3-2-045 contains procedures



for sand and dust, mud, salt water immersion, and other environmental tests applicable to infantry-type rocket launchers. Following each exposure to an environmental treatment the launcher is inspected for damage, and firing tests are performed as in 6.2.2.4 above. Rocket launchers mounted on wheels should be exposed to dust conditions and mud while being towed.

b. Following the environmental chamber exposure to salt spray, the inspection for damage should include a check for stray voltages in the launcher caused by galvanic action. Alternately, checks for galvanic action may be made by spraying a salt water solution on and in the launcher, followed by voltage and current checks. In either case, if measurable stray voltages are found, the corresponding electrical power must be much less than that required to fire a rocket motor squib.

c. If the test item is physically too large to fit into available test chambers, tests may be run in appropriate climatic areas (coastal, desert, tropic, etc.) to determine the suitability of the test item for operation in the applicable environment.

#### 6.2.3.2 Road Testing of Artillery Rocket Launchers

Road tests are conducted on mobile rocket launchers to determine the ability of the test item to be transported over main roads, secondary roads, and cross-country terrain, using various prime movers. Two general types of mobile launchers are noted: those to be towed to the firing position, and those to be transported only in the beds of prime movers (and fired from the prime mover or from the ground). Road tests of mobile weapons are described in detail in MTP 2-2-511. Gradeability and side slope performance tests are discussed in MTP 2-2-610. If the rocket launcher is a permanent part of the vehicle, and the main purpose of the vehicle is to transport the weapon, the vehicle should then be tested as a tactical transport or combat vehicle. Following the road test the launcher is disassembled as stated in paragraph 6.2.1.1g, and wear or other damage resulting from the road test is noted and recorded. Special attention should be given to the condition of the lunette, drawbar bolt, and traveling locks, as these components are the most likely to show excessive wear as a result of the road tests. The exact nature of the road conditions, weather, speed, and mileage are recorded, as well as the effects on the materiel.

#### 6.2.3.3 Transportation and Rough Handling Tests of Infantry Rocket Launchers

a. Transportation-vibration tests of packaged launchers may be conducted using laboratory simulation equipment in accordance with MTP 4-2-804. Inspection, measurement, and firing tests are performed following exposure to the vibration environment.

b. Five-foot drop tests are conducted on unpackaged infantry rocket launchers in accordance with MTP 4-2-602. Seven-foot drop tests are conducted on packaged infantry rocket launchers as described in MTP 4-2-602. The test item is inspected after each drop, and damage to the launcher is noted. Following drop testing detailed firing tests are conducted.

NOTE: If the launcher contains an optical sight, breakage to the sight or loss of boresight alignment may occur as a result

of the drop test. In this event, additional testing of unpackaged launchers (5-foot drop on earth, 3-foot drop on hard surface, etc.) may be necessary to determine the maximum rough handling that the launcher can sustain and still be serviceable. The 5-foot drop test upon hard surface, however, is the index for determining whether a weapon is rugged enough to withstand field handling by troops under battlefield conditions.

c. Loose-cargo tests may be conducted on infantry launchers. These tests simulate the effect of transporting items loosely (unpackaged) in the bed of a vehicle. The test technique is described in MTP 4-2-602. Following this test the test item is inspected for damage, loaded, and test-fired.

#### 6.2.4 Firing Tests of Artillery Rocket Launchers

Launcher firing tests are conducted to measure range and dispersion of rockets at various launcher quadrant elevations in the single-and multiple-fire modes. The launcher is tactically emplaced, traversed to a surveyed line of fire, loaded with rockets of known performance, and fired remotely. Impact locations and time of flight (stopwatch) of single-fired rounds are obtained by observers with range instruments. All rocket warheads are inert when feasible. Impact locations of multiple firings (ripples) of rockets are obtained with a helicopter-mounted aerial camera stationed over the impact area. A backup photographic system for determining impact coordinates consists of 70-mm framing cameras, ground-mounted, arranged to view the impact area for the purpose of triangulation. Additional information regarding the above techniques for location of round impact coordinates during multiple-round firing is contained in MTP 7-2-009 and 5-1-031. Weapon motion during firing (hop) is measured as discussed in MTP 3-2-816.

A typical range firing test for artillery rocket launchers consists of firing 10 to 20 single rockets and at least one full-load ripple at each of the following launcher quadrant elevations: 6°, 15°, 30°, and 45° (or the elevation for maximum range). It is also necessary to conduct ripple firing tests at the maximum quadrant elevation setting if this position is different from the elevation for maximum range. During these firing tests the launcher traverse position relative to the carriage should be varied (maximum left and right traverse, and center of traverse). Also, if possible, the launcher should be emplaced in different types of terrain (hard surface pavement, dry earth, mud, swamp, sand, etc.). It may be necessary to conduct separate firing tests at various locations to evaluate the ability of the launcher to operate properly under all required conditions of terrain emplacement.

The following information is recorded during the conduct of each range firing test:

- a. Terrain conditions, and method of launcher emplacement.
- b. Elevation of launcher trunnions above the terrain, and cant of trunnions.
- c. Launcher quadrant elevation before and after each firing test.
- d. Firing azimuth.

- e. Range, deflection, and time of flight of rounds fired.
- f. Surface meteorological data, and meteorological data aloft, up to the maximum ordinate of the round being fired.

NOTE: Range firings for ballistic data are not conducted when surface winds exceed 15 miles per hour.

The launcher is photographed during firing to detect any motion of the launcher or carriage and to record smoke and flash. If launcher brakes are included on the test item, they are applied and their effectiveness evaluated. Ease of loading the launchers and of unloading misfired rounds is noted. Noise and blast gages are set up around the test item to determine danger areas for personnel and equipment in the vicinity. The technique for obtaining these measurements is described in MTP 3-2-811. Recovery panels made of several thicknesses of wallboard insulation are positioned at appropriate locations to determine whether secondary missiles that could endanger personnel or equipment are created during firing.

In addition to the above firings, sufficient rounds should be fired from selected tubes to establish that the tube and associated firing equipment are rugged enough to endure the required number of firings. During this test and other firing tests, records should be kept of all failures to fire and other malfunctions occurring, and of repairs or adjustments made in order to continue with the test program.

#### 6.2.5 Firing Tests of Infantry Rocket Launchers

All firings are performed remotely, except as indicated in paragraph 6.2.5.4, and with inert warheads.

##### 6.2.5.1 Recoil Reaction (Pendulum) Tests

The ballistic pendulum is used to determine the recoil reaction of the weapon and the resultant rearward force impinging on the gunner's shoulder or on any fixed mount upon which the weapon is placed for firing. The weapon is suspended from a frame and fired remotely and the recoil distance recorded. A fixed scale (placed independently of the pendulum) and an indicator (on the pendulum) are used to show the magnitude of oscillation of the pendulum mount.

The horizontal deflection is recorded in inches and may be assigned a positive or negative sign in accordance with the direction of initial movement of the pendulum: a positive sign indicates movement in the opposite direction to that taken by the projectile; a negative sign indicates the same direction as that taken by the projectile.

The recoil impulse of the system (weapon and cradle) is determined from deflection units by means of the following equation:

$$M = \frac{wd\sqrt{\frac{g}{L}}}{12g}$$

where: M = Impulse (lb-sec)  
w = Weight of suspended system (lb.)  
g = 32.2 ft/sec<sup>2</sup>  
d = Horizontal deflection (in.)  
L = Effective length of pendulum suspension (ft.)

The effective length of the suspension is determined by timing the period of the particular pendulum in use. This is accomplished by taking the average time for ten successive periods and substituting in the following equation to obtain the value of "L."

$$L = \frac{g}{4\pi^2} T^2$$

Where: T = Period of pendulum (sec.)

#### 6.2.5.2 Accuracy Tests

To establish the degree of improvement in accuracy to be found in new design infantry rocket launchers, and to determine the degree to which QMR or SDR requirements for accuracy are met, an extensive accuracy test is performed. This test usually is conducted with the rocket launcher rigidly mounted in a remote firing fixture. Vertical targets, located at known ranges from the launcher muzzle, are employed. The launcher is loaded; aimed at the center of the target, using the launcher sights; and remotely fired. The test item and control launcher are fired at various ranges to the target, and at various controlled temperatures, throughout the required operating range. A sample of 20 rounds at each test condition is adequate for the analysis. Additional information on technique and data reduction for direct-fire weapon accuracy tests is contained in MTP 4-2-829.

Test data are recorded as follows for each round fired:

- a. Launcher and projectile.
- b. Conditioned temperature of launcher and projectile.
- c. Boresight elevation of launcher to the center of the target (or to the aiming point).
- d. Superelevation of launcher (elevation above boresight).
- e. Range to the target.
- f. Target size.
- g. Target impact coordinates, relative to the aiming point.
- h. Surface meteorological data, taken at firing site.

#### 6.2.5.3 Blast and Flash Tests

Blast (or noise) and flash at the rear of the weapon are determined

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with respect to limits within which they affect weapon personnel, setup, and structures. These limits are expressed in distances and angles from the bore axis of the weapon.

a. Blast areas are determined at ear positions of the crew and, when applicable, to the rear and flanks of the weapon and positions in between (Ref. MTP 3-2-811).

b. The breech and muzzle flashes are photographed at night to determine size, shape, and duration compared with flashes from standard launchers. High-speed motion pictures and still pictures are used to obtain these records.

Blast and flash are studied for their effects upon operating personnel as well as for detectability by distant observers.

#### 6.2.5.4 Manned Firing Tests

Upon completion of sufficient testing (i.e., the testing indicated in 6.2.5.1 through 6.2.5.3 above) to determine that a man can safely shoulder-fire the rocket launcher under evaluation, a test program utilizing a gunner (manned firings) is conducted. While the scope of this test varies greatly with the type and development status of the item under test, the test will be sufficient to evaluate the suitability of safety, aiming, and firing controls provided. The times required to load, aim, fire, and reload the launcher are noted and recorded, using three or more different gunners of varying height and build. If applicable, rounds are fired at moving targets, and single-shot hit probabilities at various ranges are computed. The weapon is fired from all applicable firing positions (standing, sitting, kneeling, or prone).

#### 6.3 TEST DATA

Much of the data to be recorded is indicated in paragraph 6.2. In general, detailed data on all phases of the test must be recorded. This includes observations, both positive and negative, as well as all of the quantitative information that can be derived. Environmental test data must include all details with regard to the conditions under which the item was exposed and tested.

#### 6.4 DATA REDUCTION AND PRESENTATION

##### 6.4.1 Physical and Operating Characteristics

The physical and electrical operating characteristics data obtained before the test (par. 6.2.1) are compared with measurements obtained after the environmental and rocket firing tests.

##### 6.4.2 Environmental Tests

The effects of the environmental treatments upon the launcher are analyzed to determine whether modifications are necessary to meet safety, performance, and durability requirements.

6.4.3 Firing Tests

The following computations are made using data generated during the firing tests:

- a. Average range and dispersion versus quadrant elevation and temperature of single- and multiple-rocket firings (artillery rocket launchers).
- b. Centers of impact and dispersions for groups of rockets fired against vertical targets (infantry rocket launchers).
- c. Mean number of rounds fired between failures and mean time to repair (if significant data are generated).

The firing test data are analyzed to determine:

- a. Whether the launcher meets the requirements for safety, performance, and durability.
- b. The maintenance requirements for the launcher.

6.4.4 Adequacy of Technical Literature

Based on notes accumulated during the tests (par. 6.2), recommendations are made for any needed corrections and improvements to operating and maintenance manuals.

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